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Anti-Aging Progress- The Immune System

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The field of medicine has made extensive advancements in terms of lengthening the natural process of the human life cycle and assisting humans in living long, fulfilling existences. Although this approach on life differs greatly from the previous, more holistic viewpoints of past historians and physicians that believed in a supposed eternal medicine, the lifespan of humans has increased immensely since the time of these preconceived constructs of life. The notion that life on Earth is a finite affair, though widely accepted now, was not an accredited belief as recently as a couple centuries ago. Ever since discovery of the Fountain of Youth in the early 1500s by Ponce de Leon in modern-day Florida, humans have been looking for ways to circumvent the life cycle which at the time lasted a mere 50-60 years on average in the most successful communities. Life expectancies since then have increased to the mid 70s with more humans each year reaching the triple digits due to the natural advancing prosperity of medicinal technology, but biologists and health professionals have been recently researching ways to more directly offset the natural life expectancy. While this has no correlation to the rumored fantastical healing qualities of Leon's Fountain of Youth, the reality of anti-aging lies within one of the human body's greatest assets- T cells.

T cells are members of the leukocyte (white blood cell) family, which are cells that assist the body in fighting disease. Part of the immune system, white blood cells function in groups by locating a site of infection or injury and producing proteins that demolish the destructive organism and patch up the afflicted area. Although white blood cells only account for a slight 1% of all blood cells in the human body, they provide inexplicable benefits that often regress as a person ages. Due to the small number of white blood cells in the human body, any sort of regression in the number of cells is noticeable and yields significant damage to the immune system. T cells are a form of white blood cell that exist in two variants- cytotoxic T cells and helper T cells. Cytotoxic T cells are responsible for destroying harmful organisms using cytotoxic effector molecules and CD8 receptors, while helper T cells are responsible for facilitating large-scale attacks among other white blood cells to indirectly damage harmful organisms. Although not direct members of the T cell family as they provide no specific function, regulatory T cells help to suppress and augment the functions of the other two T cell variants which is important when delegating tasks in a more significant immune response. Also known as lymphocytes due to their location within lymph tissue, it is incredibly important for humans to maintain their number of T cells as too few can result in an extreme delay of immune response and too many can indicate certain forms of cancer or internal infection.

As the aging process ensues, cells of all types become larger in size causing division to be more difficult and risky. The already limited nature of T cells coupled with their bleak aging process is what causes damage in the immune systems of humans as they age. T cells are subject to exhaustion after long periods of sustained function, with humans seeing detrimental effects as early as the middle-age period of life. This is why so many elderly patients are diagnosed with clinical immunodeficiency- T cells begin experiencing deletion at the middle-age point in the human life cycle and the still-functioning T cells grow larger and become more prone to damage in mitosis. Being the second most common cause of death in humans, cancer has stumped researchers for decades due to its ability to adapt to medication and metastasize throughout virtually every area of the body. Deaths resulting from cancer are especially prevalent in elderly populations due to the decreased number and function of T cells in these patients. However, research at the Cold Spring Harbor Laboratory has discovered a way in which T cells could be used to counteract cancer via a new form of therapy known as CAR T cell therapy. This therapy utilizes healthy, genetically altered T cells from young patients to be integrated into certain parts of a cancer patient's body to fight malignant tumors and infections. This theory has been tested using a mouse model within the laboratory as it appeared to be a long shot with a bleak possibility of success, but testing has proven its effectiveness and has been used to treat specific forms of leukemia and lymphoma and will hopefully be expanded to other forms of cancer. Likewise, this use of T cells to fight cancer can be utilized to counteract other forms of infection such as various autoimmune diseases and myeloma, as well as the natural aging process of immune system inflammation. Car T cell therapy is projected to advance in the future, with medical professionals hopeful that it could assist young, immunocompromised patients with diseases such as Hepatitis C and HIV.

The importance of the immune system in the human body is not solely contingent on ailments such as minor respiratory infections or influenza. The condition of the immune system is inexplicable in terms of quality and length of life, and this bodily function is maintained by white blood cells, specifically T cells. Despite the importance of T cells, their anatomical makeup as well as their involved function prevents them from being easily replenished, especially considering the perishable nature of all types of cells. Though the outlook on maintaining a healthy, functional immune system appears to be bleak, there have been recent breakthroughs in research pertaining to T cell therapy to introduce genetically altered T cells into the bodies of humans with compromised immune systems. This is projected to reach not only cancer patients and patients with autoimmune diseases, but also elderly patients with a compromised immune system due to natural causes. Although this new approach differs from the previously acclaimed viewpoints of holistic healing and eternal youth, utilizing these key aspects of the human body to augment its function could be the answer that researchers have been searching for since the discovery of the Fountain of Youth.

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